

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-43

Name: Lake Herman

County: Lake

Legal Description: T106N- R53W- Sec.10-11,14-15, 22-23

Location from nearest town: 2 miles west of Madison, SD.

Dates of present survey: July 21-23, 2010, September 29, 2010 (electrofishing)

Dates of last survey: June 15-17, 2009, September 10, 2009 (electrofishing)

Most recent lake management plan: F-21-R-28 (January 1, 1995-December 31, 1999)

Management classification: Warmwater Marginal

Managed Species	Other Species
Walleye	Black Crappie
Yellow Perch	Bluegill
Black Bullhead	Channel Catfish
Common Carp	Northern Pike
Bigmouth Buffalo	White Bass
	White Sucker

PHYSICAL DATA

Surface area when full: 1,287 acres

Watershed area: 36,275 acres

Maximum depth when full: 13 feet

Mean depth when full: 4.7 feet

Lake elevation observed during the survey: Full

Ordinary high water mark elevation: 1,669.0

Date set: October, 1981

Outlet elevation: 1,668.4

Date set: October, 1981

Contour map available? Yes

Date prepared: 2002

Beneficial use classification(s): (6) warmwater semipermanent fish propagation and irrigation (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Herman is listed as a meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks (GFP) owns and manages a State Park on the east side of the lake and a Lake Access Area on the west side. The remainder of the shoreline is privately owned and heavily developed.

Fishing Access

Lake Herman State Park contains a double lane boat ramp with a dock, picnic tables, comfort stations, and full service and primitive campgrounds. There are many areas suitable for shore fishing. The West Lake Access Area contains a single lane boat ramp with a dock and a public toilet. Shoreline access is limited.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Herman was turbid with a green algae bloom during this year's survey. The Secchi depth measurement was 51 cm (20 inches). Very little submerged vegetation (sago) was observed but some common cattail can be found in the northwest and south bays.

BIOLOGICAL DATA

Methods:

Lake Herman was sampled on July 21-23, 2010 with four overnight gill-net sets and ten overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 29, 2010 to evaluate walleye recruitment. Sampling locations are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

The gill-net catch was comprised mostly of yellow perch (46.4%) black bullhead (21.0%) and white suckers (19.5%) (Table 1). Walleye, white bass, northern pike, bigmouth buffalo, and channel catfish were also sampled.

Table 1. Total catch from four overnight gill net sets at Lake Herman, Lake County July 21-23, 2010.

Species	#	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Perch	124	46.4	31.0	+6.1	15.7	51	45	106
Black Bullhead	56	21.0	14.0	+4.5	6.3	68	2	99
White Sucker	52	19.5	13.0	+0.5	12.7	100	94	102
Walleye	20	7.5	5.0	+1.4	10.2	28	0	84
White Bass	6	2.2	1.5	+0.6	1.2	--	--	--
Northern Pike	5	1.9	1.3	+0.3	0.7	--	--	--
Bigmouth Buffalo	3	1.1	0.8	+1.0	1.2	--	--	--
Channel Catfish	1	0.4	0.3	+0.3	0.2	--	--	--

* 5 years (2001, 2003, 2005, 2007, 2009)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Catch per unit effort by length category for various fish species captured with gill nets in Lake Herman July 21-23, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Yellow Perch	--	31.0	15.3	1.8	14.0	31.0	<u>+6.1</u>
Black Bullhead	--	14.0	4.5	9.3	0.3	14.0	<u>+4.5</u>
White Sucker	--	13.0	--	0.8	12.3	13.0	<u>+0.5</u>
Walleye	0.5	4.5	3.3	1.3	--	5.0	<u>+1.4</u>
White Bass	--	1.5	0.8	0.3	0.5	1.5	<u>+0.6</u>
Northern Pike	0.5	0.8	0.8	--	--	1.3	<u>+0.3</u>
Bigmouth Buffalo	--	0.8	0.3	0.5	--	0.8	<u>+1.0</u>
Channel Catfish	--	0.3	--	0.3	--	0.3	<u>+0.3</u>

Length categories can be found in Appendix A.

Trap Net Catch

Black bullhead dominated the trap-net catch (59.3%, Table 3). Twelve other fish species were also sampled.

Table 3. Total catch from ten overnight trap net sets at Lake Herman, Lake County, July 21-23, 2010.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	732	59.3	73.2	<u>+17.2</u>	139.7	70	5	98
White Sucker	310	25.1	31.0	<u>+10.8</u>	9.7	100	99	93
Bigmouth Buffalo	96	7.8	9.6	<u>+6.0</u>	24.5	81	5	99
Channel Catfish	25	2.0	2.5	<u>+1.8</u>	0.4	92	8	93
White Bass	17	1.4	1.7	<u>+1.0</u>	0.5	88	71	97
Northern Pike	15	1.2	1.5	<u>+0.6</u>	0.6	13	0	84
Walleye	12	1.0	1.2	<u>+0.4</u>	2.1	30	20	86
Yellow Perch	8	0.6	0.8	<u>+0.4</u>	1.6	--	--	--
Common Carp	7	0.6	0.7	<u>+0.6</u>	0.9	--	--	--
Black Crappie	6	0.5	0.6	<u>+0.5</u>	5.4	--	--	--
Smallmouth Bass	3	0.2	0.3	<u>+0.4</u>	0.0	--	--	--
Bluegill	2	0.2	0.2	<u>+0.2</u>	0.3	--	--	--
Green Sunfish	1	0.1	0.1	<u>+0.1</u>	0.1	--	--	--

* 5 years (2001, 2003, 2005, 2007, 2009)

Table 4. Catch per unit effort by length category for various fish species captured with trap nets in Lake Herman July 21-23, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Black Bullhead	1.6	71.6	21.5	46.3	3.8	73.2	+17.2
White Sucker	--	31.0	--	0.4	30.6	31.0	+10.8
Bigmouth Buffalo	0.1	9.5	1.8	7.2	0.5	9.6	+6.0
Channel Catfish	--	2.5	0.2	2.3	--	2.5	+1.8
White Bass	--	1.7	0.2	0.3	1.2	1.7	+1.0
Northern Pike	--	1.5	1.3	0.2	--	1.5	+0.6
Walleye	0.2	1.0	0.7	0.1	0.2	1.2	+0.4
Yellow Perch						0.8	+0.4
Common Carp	0.2	0.5	--	--	0.5	0.7	+0.6
Black Crappie	--	0.6	--	0.5	0.1	0.6	+0.5
Smallmouth Bass	--	0.3	0.3	--	--	0.3	+0.4
Bluegill	--	0.2	--	--	0.2	0.2	+0.2
Green Sunfish	--	0.1	--	0.1	--	0.1	+0.1

Length categories can be found in Appendix A.

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15, a PSD range of 30-60, and a growth rate of 14 inches by age-3 in three out of five lake surveys.

Walleye gill-net CPUE increased slightly this year (Table 5), but is still under the management objective. Although four year classes from age-0 to age-5 were sampled, most fish were from the fry-stocked 2008 year class (Table 6). Lengths of all sampled walleyes ranged from 120 to 490 mm (4.7 – 19.3 in) with an average of 316 mm (12.4 inches; Figure 1).

Table 5. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 2003-2010.

	2003	2004	2005	2006	2007	2008	2009	2010	Mean*
CPUE	20.0		11.5		12.0		2.7	5.0	10.2
PSD	40		5		8		--	28	20
RSD-P	3		3		3		--	0	2
Mean Wr	94		87		86		--	84	88

* 5 years (2001, 2003, 2005, 2007, 2009)

Table 6. Weighted mean length at capture (mm) for walleye captured in gill nets in Lake Herman, Lake County, 1999-2010. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size in parentheses.

Year	1	2	3	4	5	6	7	8	9	10	11	12
2010 (19)	--	276 (11)	349 (5)	--	470 (3)	--	--	--	--	--	--	--
2009 (8)	--	263 (2)	--	433 (5)	--	550 (1)	--	--	--	--	--	--
2007 (36)	--	303 (31)	360 (1)	377 (3)	--	--	644 (1)	--	--	--	--	--
2005 (46)	215 (2)	259 (42)	--	--	479 (1)	--	710 (1)	--	--	--	--	--
2003 (80)	--	354 (45)	406 (26)	453 (3)	500 (4)	480 (2)	--	--	--	--	--	--
2001 (14)	218 (6)	--	357 (5)	366 (3)	--	--	--	--	--	--	--	--
1999 (50)	195 (4)	291 (4)	336 (37)	410 (5)	--	--	--	--	--	--	--	--

A very weak walleye year class was naturally-produced in 2010 (Table 7). The age-0 walleyes sampled were small even though abundance was low. No yearlings were collected from the weak 2009 year class. Large fingerlings (1,312) were stocked in October to help fill the void.

Table 7. Age-0 and age-1 walleyes sampled by nighttime electrofishing on Lake Herman, Lake County, 1996-2010.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2010	none	1	0-3		111 (110-112)	80	0			
2009	none	7	3-11		146 (138-158)	81	10	8-12	224 (197-230)	77
2008	fry	65	35-95	73 ²	107 (87-146)	88	24	13-35	214 (177-251)	103
2007	fry	117	81-141	94	104 (86-207)	90	0			
2006	none	0					47	6-86	271 (229-325)	90
2005	fry	142	68-216	100	155 (111-192)	87	0			
2004	none	1	0-2		151 (146-155)	86	54	37-70	241 (207-280)	83
2003	fingerling	293	166-419	100	160 (125-187)	92	0			
2002	none	0					7	0-15	311 (277-341)	104
2001	none	133	110-157		158 (122-184)	91	9	5-13	283 (198-314)	87
2000	fry	35	21-49	¹	167 (142-195)	91	0			
1999	none	5			200 (192-212)		65			
1998	fry	72		99	145 (106-178)		104			
1997	fry	93		100	149 (121-182)		11			
1996	fry	24		100	144 (125-163)		247			

¹ No evaluation done.

² OTC marks were faint; and therefore, I had difficulty discerning marked from unmarked fish. I believe that there was a greater likelihood of incorrectly identifying marked individuals as unmarked rather than unmarked fish as marked.

Yellow Perch

Management objective: Maintain a gill-net CPUE of at least 30 with a PSD range of 30-60 in three out of ten lake surveys.

Yellow perch gill net CPUE increased from 2009 and meets the management objective (Table 8). The sampled perch ranged in length from 130 –280 mm (5.1–11.0 in) (Figure 2) and were in very good condition with a mean Wr of 106 (Table 8). Growth is fast with fish reaching an average size of nearly 260 mm (10.2 inches) by the middle of their fourth summer (Table 9). Yellow perch fry (7,539,000) were stocked in spring 2009, but were not marked so it cannot be determined if the 60 age-1 fish sampled this year are from that stocking (Table 9).

Table 8. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 2003-2010.

	2003	2004	2005	2006	2007	2008	2009	2010	Mean*
CPUE	28.0		13.0		4.3		14.7	31.0	15.7
PSD	96		86		100		88	51	91
RSD-P	10		74		69		0	45	32
Mean Wr	107		101		100		106	106	104

* 5 years (2001, 2003, 2005, 2007, 2009)

Table 9. Weighted mean length at capture (mm) for yellow perch captured in gill nets in Lake Herman, Lake County, 2010. Sample size is in parentheses.

Year	1	2	3	4	5	6	7	8
2010 (124)	155 (60)	191 (1)	259 (63)	--	--	--	--	--

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of no more than 100.

Black bullhead trap net CPUE decreased in 2010 (Table 10), and is within the management objective. Several year classes were sampled with and a wide range of lengths from 130 mm to 320 mm (5.1 – 12.6 in). Over 70% of the catch measured over 23 cm (9 in), the minimum size typically harvested by anglers. (Figure 4).

Table 10. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Herman, Lake County, 2003-2010.

	2003	2004	2005	2006	2007	2008	2009	2010	Mean*
CPUE	480.4		21.3		32.2		134.4	73.2	139.7
PSD	91		97		41		41	70	73
RSD-P	6		60		11		0	5	23
Mean Wr	100		94		88		110	98	98

* 5 years (2001, 2003, 2005, 2007, 2009)

All Species

Channel catfish CPUE has increased and angler catches have been reported (Table 11). CPUE for northern pike has also increased. Few common carp have been captured in the gill nets or trap nets over the past 10 years. An SDSU study estimated carp biomass at over 500 pounds/acre during this period demonstrating just how ineffective these gears are at sampling common carp.

Table 11. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Herman, Lake County, 2002-2010.

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010
COC (GN)		0.3		0.5		0.3		--	--
COC (TN)		0.9		0.4		0.6		--	0.7
WHS (GN)		14.0		13.8		15.3		15.0	13.0
WHS (TN)		6.7		1.2		12.4		11.1	31.0
BIB (GN)		--		5.8		0.3		--	0.8
BIB (TN)		1.2		99.4		5.8		10.1	9.6
BLB (GN)		21.8		0.5		1.7		6.0	14.0
BLB (TN)		480.4		21.3		32.2		134.4	73.2
CCF (GN)		--		--		--		1.0	0.3
CCF (TN)		--		0.1		--		2.1	2.5
NOP (GN)		1.5		--		0.7		1.3	1.3
NOP (TN)		0.4		0.2		1.0		0.3	1.5
WHB (GN)		--		--		2.7		3.3	1.5
WHB (TN)		--		--		0.6		1.9	1.7
GSF (GN)		--		--		--		--	--
GSF (TN)		0.4		--		--		--	0.1
BLG (GN)		--		--		--		--	--
BLG (TN)		0.1		--		0.5		0.8	0.2
SMB (GN)		--		--		--		--	--
SMB (TN)		0.1		0.1		--		--	0.3
BLC (GN)		--		--		--		--	--
BLC (TN)		4.4		0.2		5.9		0.1	0.6
YEP (GN)		28.0		13.0		4.3		14.7	31.0
YEP (TN)		1.8		--		0.6		0.6	0.8
WAE (GN)		20.0		11.5		12.0		2.7	5.0
WAE (TN)		1.2		--		5.0		2.1	1.2

COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), BLB (Black Bullhead), CCF (Channel Catfish), NOP (Northern Pike), WHB (White Bass), GSF (Green Sunfish), BLG (Bluegill), SMB (Smallmouth Bass), BLC (Black Crappie), YEP (Yellow Perch), WAE (Walleye)

MANAGEMENT RECOMMENDATIONS

1. Conduct annual lake surveys to monitor the fish populations.
2. Stock yellow perch and walleye fry or fingerlings as needed to fill gaps of failed natural reproduction.
3. Consider a habitat improvement plan that will benefit panfish and walleye reproduction, increase survival of young fish, reduce the number of rough fish, and improve water quality.

Table 12. Stocking record for Lake Herman, Lake County, 1991-2010.

Year	Number	Species	Size
1991	41,640	Yellow Perch	Fingerling
	17,800	Walleye	Lrg. Fingerling
	6,421	Walleye	Med. Fingerling
1992	170,000	Saugeye	Sml. Fingerling
	145	Walleye	Lrg. Fingerling
	162,500	Yellow Perch	Fingerling
1993	67,500	Saugeye	Sml. Fingerling
	67,500	Walleye	Sml. Fingerling
1995	41,000	Fathead Minnow	Adult
	135,000	Walleye	Fingerling
1996	2,707,000	Walleye	Fry
	136,840	Yellow Perch	Fingerling
1997	2,700,000	Walleye	Fry
1998	2,700,000	Walleye	Fry
1999	13,572	Yellow Perch	Adult
2000	126,474	Walleye	Fingerling
	2,800	Yellow Perch	Adult
2003	137,620	Walleye	Fingerling
2005	2,000,000	Walleye	Fry
2007	1,400,000	Walleye	Fry
2008	1,400,000	Walleye	Fry
2009	7,539,000	Yellow Perch	Fry
2010	1,312	Walleye	Lrg. Fingerling

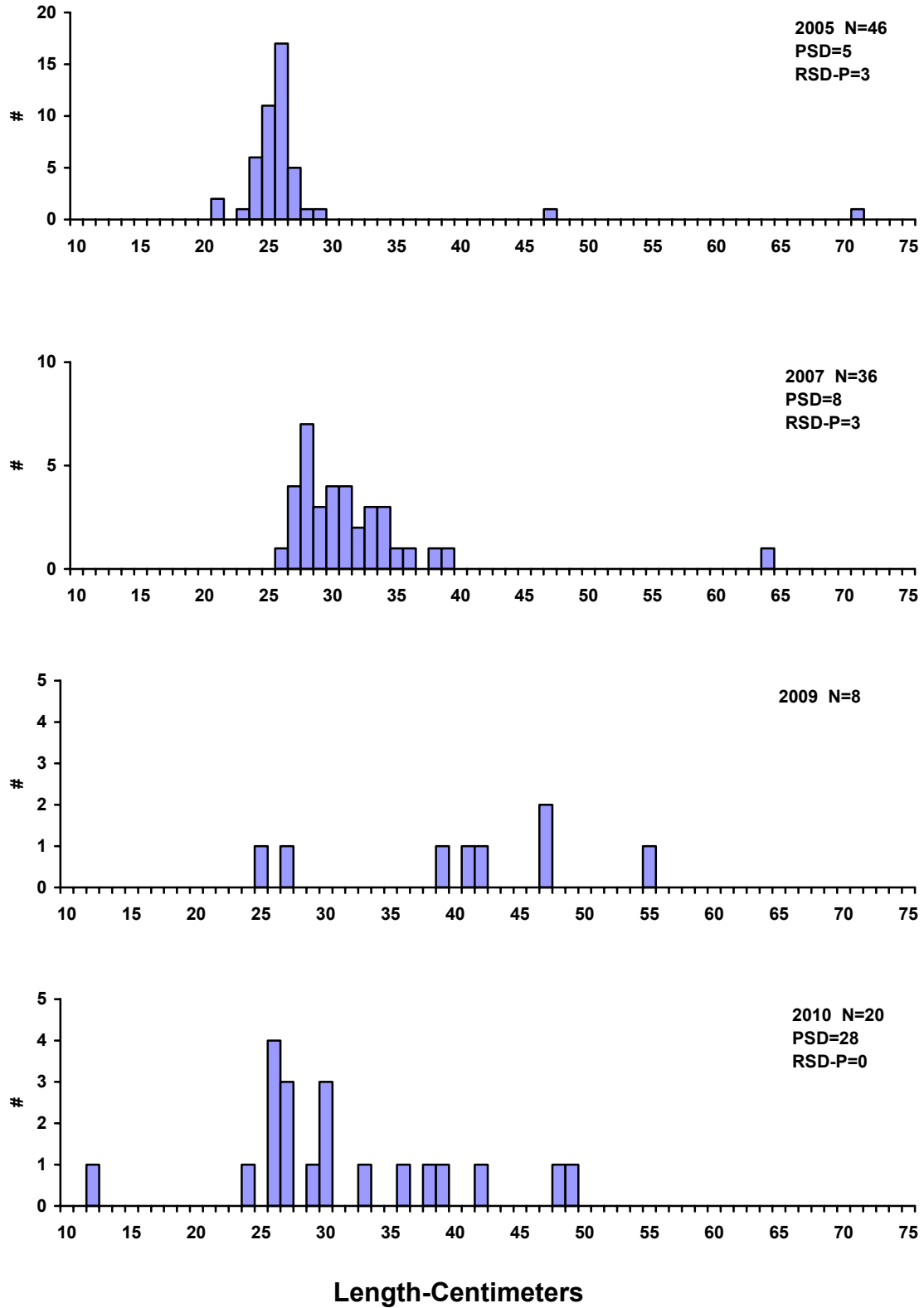


Figure 1. Length frequency histograms for walleye sampled with gill nets in Lake Herman, Lake County, 2005, 2007, 2009, 2010.

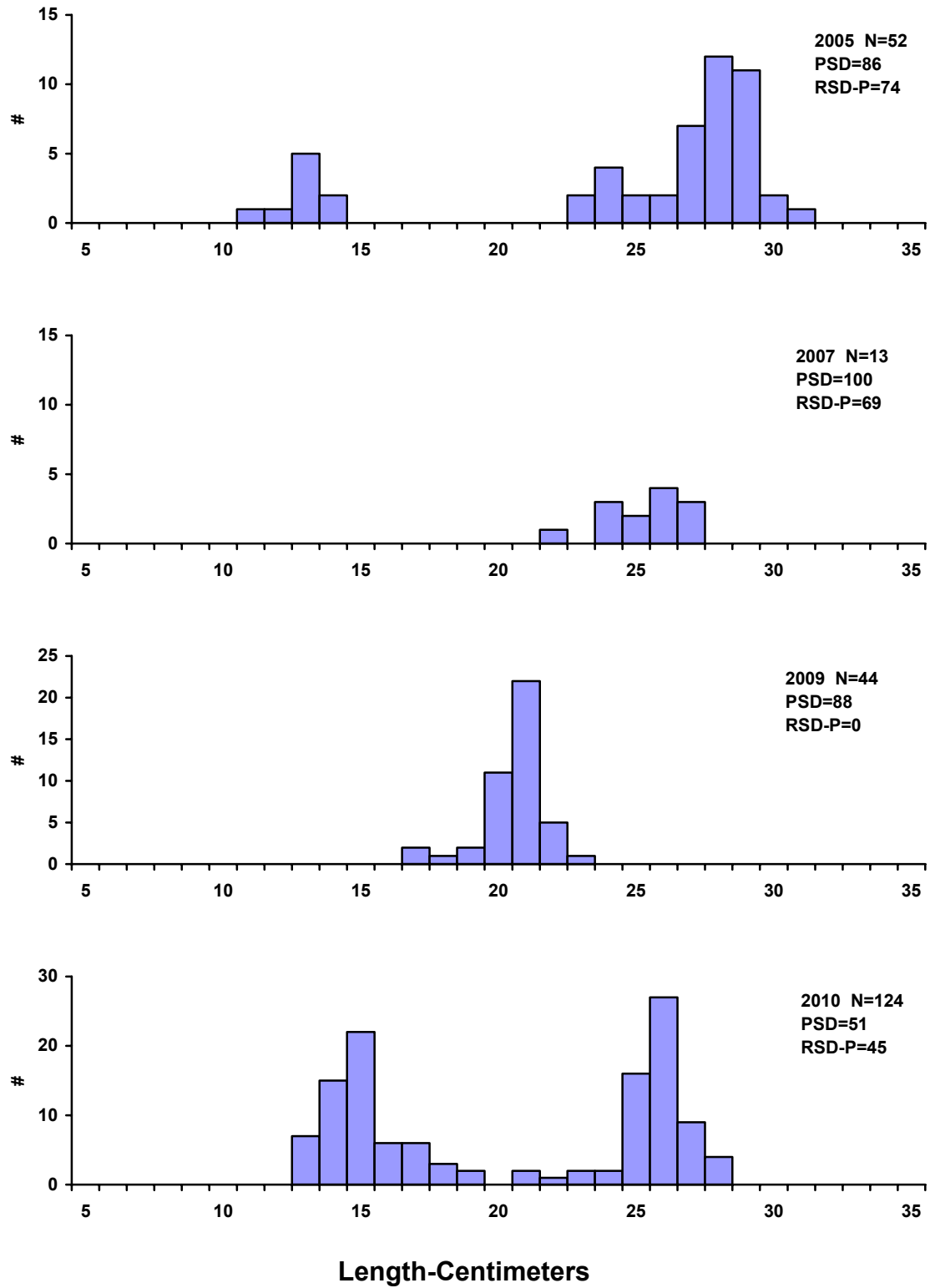


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Lake Herman, Lake County, 2005, 2007, 2009, 2010.

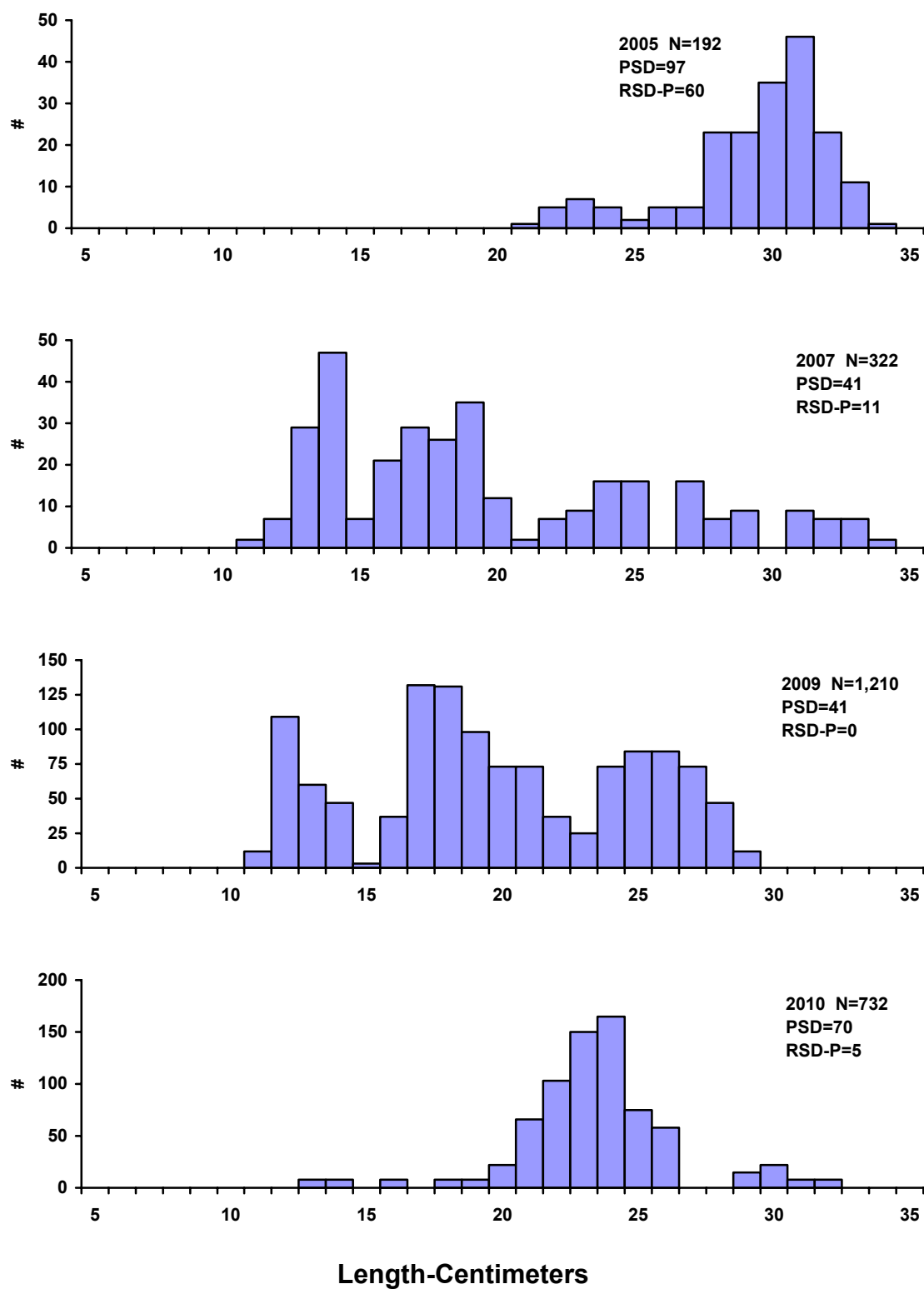


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Lake Herman, Lake County, 2005, 2007, 2009, 2010.

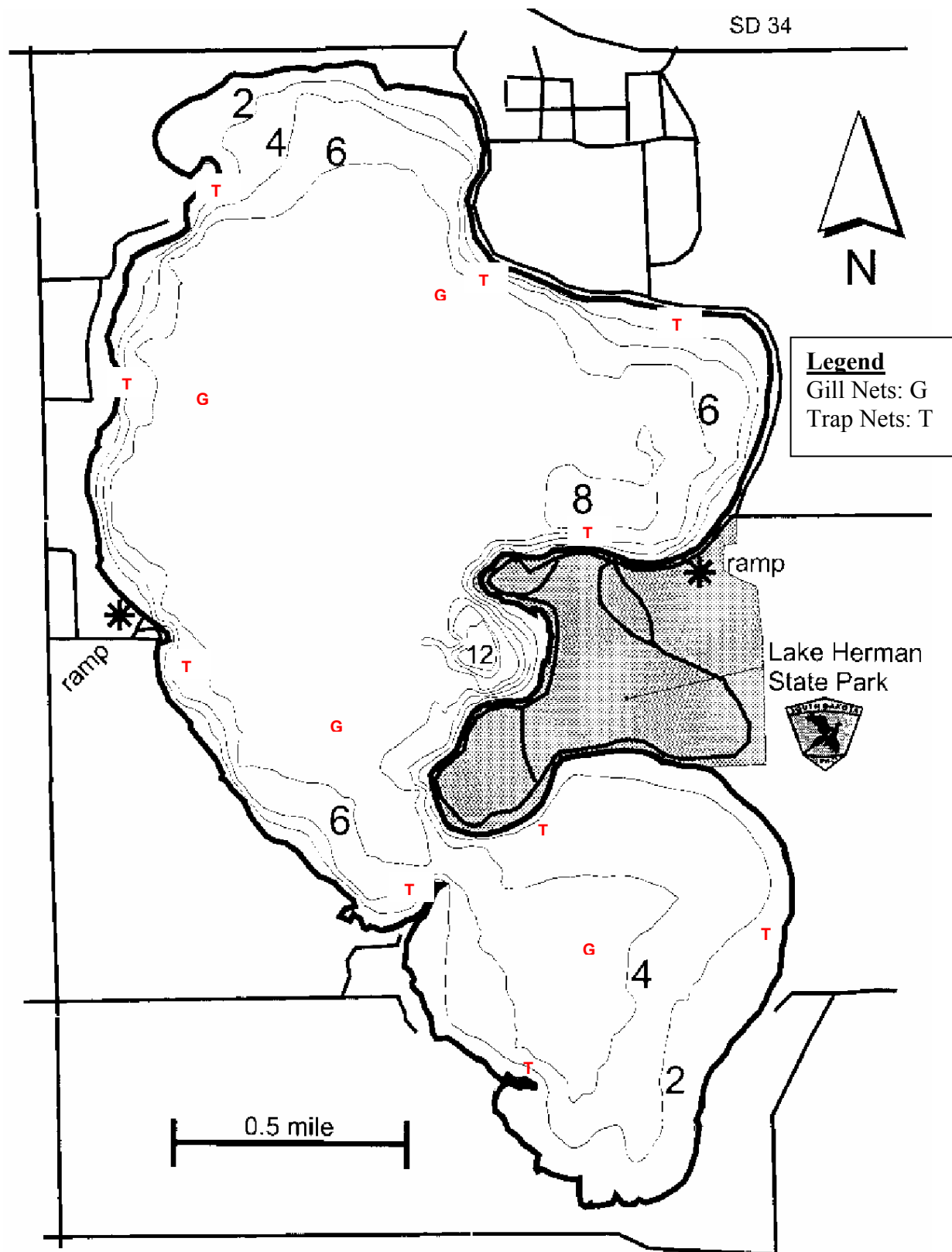


Figure 4. Sampling locations on Lake Herman, Lake County, 2010.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25 (10)	38 (15)	51 (20)	63 (25)	76 (30)
Yellow perch	13 (5)	20 (8)	25 (10)	30 (12)	38 (15)
Black crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
White crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
Bluegill	8 (3)	15 (6)	20 (8)	25 (10)	30 (12)
Largemouth bass	20 (8)	30 (12)	38 (15)	51 (20)	63 (25)
Smallmouth bass	18 (7)	28 (11)	35(14)	43 (17)	51 (20)
Northern pike	35 (14)	53 (21)	71 (28)	86 (34)	112 (44)
Channel catfish	28 (11)	41 (16)	61 (24)	71 (28)	91 (36)
Black bullhead	15 (6)	23 (9)	30 (12)	38 (15)	46 (18)
Common carp	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)
Bigmouth buffalo	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.